IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.: 09/832,410 Confirmation No.: 9531
Appellant: Schmidl et al
Filed: April 10, 2001
TC/AU: 2634
Examiner: Wang

Docket: TI-30895
Cust. No.: 23494

APPELLANTS' BRIEF

Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

The attached sheets contain the Rule 41.37 items of appellants' brief; this brief is pursuant to MPEP 1204.01 (Reinstatement of Appeal). The fee for filing a brief in support of the appeal has previously been paid; but the Commissioner is hereby authorized to charge any other necessary fees to the deposit account of Texas Instruments Incorporated, account No. 20-0668.

Respectfully submitted,

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Rule 41.37(c)(1)(i) Real party of interest

Texas Instruments Incorporated owns the application.

Rule 41.37(c)(1)(ii) Related appeals and interferences

There are no related dispositive appeals or interferences.

Rule 41.37(c)(1)(iii) Status of claims

Claims 1-12 are pending in the application with claims 5-12 allowed and claims 1-4 finally rejected. This appeal involves the finally rejected claims.

Rule 41.37(c)(1)(iv) Status of amendments

There is no amendment after final rejection.

Rule 41.37(c)(1)(v) Summary of claimed subject matter

Claims 1-4 provides a method of wireless communication for a transmitter with multiple antennas and a receiver with multiple antennas. The method estimates an eigenvector of the matrix of communication channel coefficients between the transmitter antennas and receiver antennas and then uses the eigenvector components for relative weighting of the baseband signals on the transmitter antennas. Application Fig.1 shows the case of 2 transmitter antennas and 2 receiver antennas; and page 4, last paragraph through page 5, second paragraph describe the eigenvector component relative weightings for the signals on the transmission antennas.

Rule 41.37(c)(1)(vi) Grounds of rejection to be reviewed on appeal

The grounds of rejection to be reviewed on appeal are:

(1) Claims 1-4 were rejected as indefinite.

(2) Claims 1-4 were rejected as unpatentable over the Harrison reference in view of the Vook reference.

Rule 41.37(c)(1)(vii) Arguments

(1) Claims 1-4 were rejected as indefinite. The Examiner cited the claim 1 phrase "the relative weightings of baseband signals" as indefinite because the signals may be either on the transmitter antennas or on the receiver antennas. Further the subphrase "the relative weightings" was cited as indefinite.

Appellants reply that the phrase "the relative weightings of baseband signals" appears in step (b) of claim 1 which reads in full as follows: "transmitting using said first plurality of antennas with the relative weightings of baseband signals on said first plurality of antennas corresponding to components of said at least one eigenvector;". This makes clear that the relative weightings of baseband signals is for signals on the transmitter antennas.

Additionally, the subphrase "the relative weightings" would be understood by one of ordinary skill in the art as simply meaning that the weightings for the baseband signals are proportional to the components of the eigenvector. Indeed, without the adjective "relative" the claim could be construed as requiring the weightings to be equal to the components of the eigenvector and this itself would be indefinite without some explicit normalization of the eigenvector and of the baseband signals.

(2) Claims 1-4 were rejected as unpatentable over Harrison in view of Vook. The Examiner cited Harrison for transmitting with an antenna array having eigenvector weightings (column 3, lines 1-27 and column 4, lines 54-67) and added Vook for transmission between a transmitting antenna array and a receiving antenna array (Figs.1-2, column 4, lines 21-45, and column 7, lines 54-55 and 58-62).

Appellants reply first that Harrison has only a single antenna for the receiver (column 5, lines 1-12) and thus does not have a matrix of channel coefficients as required in step (a) of claim 1. Rather, Harrison gets weights for the transmitter antennas (Fig.5, item 306 and column 6, lines 44-64) from the maximum eigenvector of the channel impulse response sample autocorrelation matrix (column 3, line 42 to column 4, line 2). That is, with $\alpha_i(j)$ denoting an estimate of the impulse response function for the channel from the i^{th} transmitter

antenna ($1 \le i \le n$) to the single receiver antenna and at time delay j ($1 \le j \le M$), the i,k autocorrelation matrix element is:

$$\sum_{j=1}^{M} \alpha_i^*(j)\alpha_k(j)$$

where "*" denotes the complex conjugate. And there is no obvious extension to a plurality of receiver antennas.

Next, Vook does indeed consider base stations with multiple antennas and mobile units with either one antenna or multiple antennas. However, the antenna weightings relate to SDMA (spatial division multiple access) in which two or more transmitters are using the same time and frequency slot, and the receiver antennas are weighted for directionality to select only a single one of the two or more transmitters; see the cited column 4, lines 21-45 and Fig.2. Thus Vook is not related to the transmitter antenna weightings of Harrison and claim 1; and the combination of Harrison and Vook does not suggest claim 1. Consequently, claim 1 plus its dependent claims 2-4 are patentable over the references.

Rule 41.37(c)(1)(viii) Claims appendix

1. A method of wireless communication, comprising:

(a) estimating at least one eigenvector of a matrix of communication channel coefficients for a channel between a first plurality of antennas and a second plurality of antennas; and

(b) transmitting using said first plurality of antennas with the relative weightings of baseband signals on said first plurality of antennas corresponding to components of said at least one eigenvector.

2. The method of claim 1, wherein:

(c) said communication channel has MN coefficients, α_{ij} for i = 1, …, M and j = 1, …, N where M and N are positive integers, and α_{ij} relates to transmission from the ith antenna of a transmitter to the jth antenna of a receiver, and said matrix is CC^H where C is the M x N matrix with ith row and jth column entry α_{ij} and ^{H} is Hermitian conjugate.

3. The method of claim 2, wherein:

(d) said signals on said antennas are a superposition of first signals weighted according to a first eigenvector of CC^H plus second signals weighted according to a second eigenvector of CC^H wherein the superposition depends upon first and second eigenvalues of CC^H.

4. The method of claim 3, wherein:

(a) number of bits allocated between said first signals and said second signals depends upon the ratio of said first eigenvalue and said second eigenvalue.

Rule 41.37(c)(1)(ix) Evidence appendix

n/a

Rule 41.37(c)(1)(x) Related proceedings appendix

n/a